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(54) Approximating apparatus for surgical jaw structure

Näherungsvorrichtung für chirurgische Klemmbackenstruktur

Dispositif de rapprochement pour une structure chirurgicale à mâchoires

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to approximating apparatus for surgical instrumentation and more particularly to apparatus which effects substantially parallel approximation of the jaw structure for surgical instrumentation. Apparatus in accordance with the precharacterising part of claim 1 below is disclosed in US-A-4 607 636.

2. Description of the Related Art

A wide variety of surgical procedures used today involve surgical instrumentation having jaw structure such as, for example, grippers, graspers, dissectors, clamps, cutting elements, stapling elements and tissue measuring devices. In each of these types of jaw structure affected tissue is captured by the jaws for manipulation. The ease and accuracy of this tissue capturing step is extremely important if the surgical procedure is to be carried out in an efficient manner. One type of jaw structure currently used captures tissue by a pivotal action of the jaw structure wherein the jaws close progressively from a pivot point outward to the end of the jaw structure. See, for example U.S. Patent Nos. 3,866,610; 4,243,047; 4,369,788; 4,512,343; 4,572,185; 4,590,936 and 4,674,501. Another disclosure of pivoting jaws, but including a cam surface on each jaw to initiate the jaw rotation, is to be seen in the forceps device of EP-A-0 211 114. This pivotal action can, in certain circumstances, overcompress captured tissue nearest to pivot point while undercompressing captured tissue near the ends of the jaw structure. The uneven compression can result in uneven cutting, unintentional tissue trauma, and/or inaccurate tissue measurement or joining. This is particularly true in endoscopic or laparoscopic procedures where accessibility is extremely limited. In these procedures accuracy and precision are vitally important. Apparatus must be capable of easily and accurately capturing tissue for subsequent manipulation without unintentional trauma.

A more accurate and atraumatic way of approximating surgical jaw structure is by parallel approximation. This approach has been utilized with some success in the area of surgical clamping. For example, in U.S. Patent Nos. 4,931,058 (Cooper) and 4,976,721 (Blasnik et al.) surgical clamp structure is shown wherein spring loaded parallel clamping jaws are moved together in parallel orientation by compression of locking structure disposed on an end of the jaw structure. These surgical clamps however are not readily operable in remote or limited visibility applications such as, for example, endoscopic or laparoscopic procedures and do not make use of camming action.

Similarly, some surgical stapler designs make use of parallel approximation to facilitate capture and joining of tissue. For example, U.S. Patent Nos. 3,269,630; 3,795,034; 4,319,576; 4,442,964; 4,603,693; 4,788,978 and 4,930,503 disclose some degree of parallel approximation of anvils and staple cartridge elements. However, these designs are somewhat bulky and in some cases difficult to manipulate. U.S. Patent No. 3,844,289 shows a scissors type hemostat having L-shaped jaw structure for capturing tissue therebetween. A clip applier is attached to the hemostat for clipping the captured tissue. In operation, the clip applier moves substantially perpendicular to the plane of the working ends of the hemostat jaw structure by means of pins and slots to clip the captured tissue. None of these references utilize camming structure or a camming action to effect substantially parallel approximation of surgical jaw structure while maintaining an efficient and simple mode of operation for the working ends thereof.

Therefore, it would be highly desirable to have approximating jaw structure for surgical instrumentation which allows for accurate and precise substantially parallel approximation in remote or limited accessibility applications.

Accordingly, it is an object of the present invention to provide endoscopic or laparoscopic apparatus for approximating jaw structure which provides accurate substantially parallel capture of subject tissue.

Another object of the present invention is to provide endoscopic or laparoscopic apparatus for approximating jaw structure for surgical instrumentation which permits parallel approximation of jaw structure on subject tissue in remote or limited accessibility conditions.

Other and further objects of the present invention will be explained hereinafter, and will be more particularly delineated in the appended claims, and other objects of the present invention will hereinafter become apparent to one with ordinary skill in the art to which the present invention pertains.

SUMMARY OF THE INVENTION

The present invention is embodied in an approximating apparatus for jaw structure in surgical instrumentation such as, for example, grippers, graspers, dissectors, cutters, measurers, staplers, etc. The invention is characterised by the features recited in claim 1 below. This approximating apparatus effects substantially parallel approximation of first and second surgical jaw structure to permit substantially parallel working interaction therebetween. The approximating apparatus includes camming structure engaging at least one movable jaw of the surgical jaw structure to bias that jaw structure toward a second jaw structure. In one embodiment, a camming plate is provided with parallel diagonal camming slots formed therein. The camming plate is axially disposed in a housing mounting a stationary surgical jaw structure. A movable jaw structure is mounted in the housing for substantially parallel movement perpendicular to the plane of the stationary surgical jaw

structure. The movable jaw structure is blocked against axial movement within the housing. Camming pins, attached to the movable jaw structure, ride in the parallel diagonal camming slots in the camming plate. As the camming plate is moved axially within the housing, the movable jaw structure moves perpendicular to the plane of the stationary jaw structure into parallel approximation with the stationary jaw structure.

Other camming structure may be utilized within the scope of the present invention to achieve substantially parallel approximation of a movable surgical jaw structure relative to a stationary surgical jaw structure. For example, camming surfaces may be provided on the movable surgical jaw structure which are engaged by a camming tube adapted for distal and proximal axial movement around at least a portion of the movable and stationary surgical jaw structure. The camming surfaces on the camming tube engage the camming surfaces on the movable surgical jaw structure to move it in substantially parallel approximation in a direction perpendicular to the longitudinal plane of the stationary surgical jaw structure.

In particularly advantageous embodiments of the present invention, the camming surfaces and or slots may be angled for example to widen the initial distal spacing of the surgical jaw structure to assist in the capture of tissue. Also, it is contemplated that the approximating apparatus for the surgical jaw structure can be formed as a separate removable unit for interchangability with various types of actuating means. For example, approximating tissue measuring jaws could be removed from an actuating means and replaced with stapling jaws or cutting jaws, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

For a further understanding of the objects of the present invention, reference is made to the following detailed description of preferred embodiments which is to be taken in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective view in cross section of an apparatus in accordance with the present invention utilizing tissue measuring jaw structure shown in the closed approximated position;

FIG. 2 is a side view in cross section of the apparatus of FIG. 1 showing the tissue measuring jaw structure in the open position;

FIG. 3 is an exploded perspective view of the tissue measuring apparatus of FIG. 1.

FIG. 4 is a side view in partial cross section of apparatus in accordance with the present invention utilizing surgical clamping jaw structure shown in the open position;

FIG. 5 is a perspective view of apparatus in accordance with the present invention utilizing surgical stapling jaw structure shown in the open position;

FIG. 6 is a side view of the apparatus of FIG. 5 removably attached to an actuating device;

FIG. 7 is a side view in cross section of apparatus in accordance with the present invention utilizing surgical gripping jaw structure shown in the open position;

FIG. 8 is an end view of the apparatus of FIG. 7 along line 8-8;

FIG. 9 is a side view in cross section of apparatus in accordance with the present invention as in FIG. 7 shown in the closed position;

FIG. 10 is an end view in cross section of the apparatus of FIG. 9 taken along line 10-10;

FIG. 11 is a perspective view in partial cross section of apparatus in accordance with the present invention utilizing surgical cleaving jaw structure;

FIG. 12 is a side view in cross section of the apparatus of FIG. 11 in the extended open position;

FIG. 13 is a side view in cross section of the apparatus of FIG. 11 in the open position; and

FIG. 14 is a side view in cross section of the apparatus of FIG. 11 in the closed position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to FIGS. 1-14 wherein like parts have been given like index numerals and initially to FIGS. 1-3, there is shown approximating apparatus (otherwise called endoscopic means) in accordance with a preferred embodiment of the present invention for use in endoscopic tissue measuring instrumentation 20. A stationary first jaw structure 22 is integrally formed on a distal end 24 of tubular frame means 26 in axial alignment therewith. A second movable jaw structure 28 is movably retained by the tubular frame means 26 for substantially parallel approximation with the stationary first jaw structure 22. Second movable jaw structure 28 comprises a pair of dog leg frame members 30 having proximal and distal ends 32, 34. A jaw sleeve 36 overfits both distal ends 34 of the dog leg frame member 30 and assists in holding the members together. The proximal ends 32 are disposed parallel to one another and define a yoke therebetween. A first camming pin 40 is inserted through opposing transverse bores 42 formed in the proximal ends 32 of the dog leg frame members 30 and is flush with the outer surface of the dog leg frame members 30. A second camming pin 44 is inserted in opposing transverse bores 46 formed proximal to opposing bores 42 in the proximal ends 32 of the dog leg frame members 30. Second camming pin 44 extends transversely beyond the outer surface of the dog leg frame members 30 and engage a pair of perpendicular grooves 48 formed in the side walls of tubular frame means 26. This second camming pin 44 prevents longitudinal motion of the second movable jaw structure 28 relative to stationary jaw structure 22 and serves to assist in guiding the second jaw structure 28 in substantially parallel approximation with the stationary jaw structure 22.

A camming plate 50 having first and second camming slots 52, 54 is axially positioned in the yoke formed by the proximal ends 32 of dog leg frame members 30 for longitudinal movement therethrough. First and second camming pins 40, 44 are disposed in first and second camming slots 52, 54 for longitudinal angular movement therein. In the embodiment shown in FIGS. 1-3 first and second camming slots 52, 54 extend diagonally and remain substantially parallel for approximately half of their height. Thereafter, second camming slot 54 extends in a plane substantially parallel to the longitudinal axis of tubular frame means 26 while first camming slot 52 continues diagonally. This feature permits the opening between the distal ends of the first and second jaw structure "A" to be overextended with respect to the opening at the proximal portion of the jaw structure "B". Thus, initial capture of tissue is facilitated by the widened jaw orientation. Thereafter, the jaw structure will reorient to substantially parallel alignment to permit substantially parallel approximation and working interaction between the jaws.

In the embodiment of FIGS. 1-3 the tissue measuring device 20 is normally oriented with the jaw structure in the closed approximated position (see FIG. 1). The actuating mechanism for effecting longitudinal movement of camming plate 50 and thus the substantially parallel movement of jaw structure 28 relative to jaw structure 22 includes a shaft 56 attached at a distal end 58 to a proximal end of a camming bar, a compression spring 60 and plunger 62 attached to a proximal end 64 of shaft 56. A longitudinal cavity 66 is dimensioned and configured in a proximal end 68 of tubular housing 26 to retain compression spring 60. A distal end 70 of compression spring 60 abuts annular step 72 formed in the tubular frame means 26 while the proximal end 74 of compression spring 60 contacts the distal end 76 of plunger 62.

Distal longitudinal movement of plunger 62 compresses spring 60 and drives shaft 56 axially within tubular frame means 26. A circumferential flange 78 is formed around the outside of the proximal end 68 of the tubular frame means 26 to assist in compression of plunger 62. The camming bar is driven in a distal longitudinal direction causing first and second camming pins 40, 44 to ride in first and second camming slots 52, 54 respectively to open jaw structure 28 relative to stationary jaw structure 22. Since second camming pin 44 is restricted from axial movement by perpendicular grooves 48, jaw structure 22 and 28 move apart in a substantially parallel orientation. Once the tissue is captured within the jaws 22, 28, the plunger 62 is released and compression spring 60 serves to reverse the longitudinal direction of shaft 56 causing the jaws to close on the tissue. The force of compression spring 60 is selected to provide an accurate measurement of tissue thickness, i.e., so as not to cause undue tissue compression.

Where relatively thick tissue (i.e. thicker than about 0.25 cm (0.1 inch) is to be captured and measured, supplemental approximation assist means may be incorporated to assure quick and accurate measurement. In the embodiment of FIGS. 1-3, supplemental approximation assist means, shown generally at 59, is positioned in slot 63 formed in camming plate 50 and includes a secondary compression spring 61 and fork 65. Both spring 61 and fork 65 are dimensioned and configured to fit longitudinally within slot 63 with arms 67, 69 of fork 65 extending distally beyond slot 63 to abut and engage the proximal ends 32 of dog leg frame members 30 as necessary. The force of secondary compression spring 61 is selected so as to provide supplemental approximation assistance to compression spring 60 when thick tissue is to be measured. Thus, as shown in FIGS. 1 and 2, when the endoscopic tissue measuring instrument 20 is closed or approximated around relatively thin tissue (FIG. 1), arms 67, 69 of fork 65 do not engage the proximal ends 32 of dog leg frame members 30. However, referring to FIG. 2, as the second jaw structure 28 is opened relative to first jaw structure 22, the proximal ends 32 of dog leg frame members 30 engage the arms 67, 69 of fork 65 and serve to compress secondary spring 61 in slot 63. When capture of tissue is completed, the combined expansion forces of compression spring 60 and secondary compression spring 61 serve to approximate jaw structures 22 and 28 to provide a quick and accurate measurement of the captured tissue. One skilled in the art will readily appreciate that other types of approximation assist means may be incorporated to assist as necessary in the closure of surgical jaw structure and that such assist means may be adapted to engage and/or assist in closure during any stage of approximation or separation of the surgical jaw structure.

In the embodiment shown in FIGS. 1-3 visual measurement apparatus is incorporated into both the proximal and distal ends of tubular frame means 26. At the distal end, a measuring jacket 80 is positioned over dog leg frame members 30 and gauges the vertical position of movable second jaw structure 28 relative to first jaw structure 22. A window 82 is provided in tubular frame means 26 adjacent measuring jacket 80 to facilitate reading the measurement. Graduations may be provided on jacket 80 which translate into thickness measurements of the captured tissue. At the proximal end of tubular frame means 26 a second window is provided to accurately determine the axial position of plunger 62 relative to frame means 26. Graduations may be provided on plunger 62 which translate into thickness measurements of the captured tissue.

This embodiment of the approximating apparatus utilized in a tissue measuring configuration is designed to measure the thickness of tissue captured between the jaw structure 22, 28. One skilled in the art will readily appreciate that the instrumentation can be configured to make other tissue measurements such as, for example, inner diameters of hollow body organs simply by utilizing the outer surfaces of the jaw structure as the measuring point. Thus the jaw would be inserted into the

hollow organ and expanded in a substantially parallel manner until the outer surfaces of the jaw structure contacts the inner surface of the hollow organ. A measurement of the inner diameter of that organ can then be generated.

Various known actuating mechanisms may be utilized to drive camming plate 50 including, for example, axial screw type structure, folding handles, scissors or pistol grip type structures capable of effecting axial longitudinal movement of the camming bar. Further, the tissue measuring device 20 shown in FIGS. 1-3 is designed and configured for advantageous use in endoscopic or laparoscopic procedures wherein the tubular frame means 26 is inserted through a cannula for manipulation inside an enclosed body cavity. Various other housing configurations are possible for use not limited to insertion through a cannula. These housing configurations are within the scope of one skilled in the art.

Referring to FIG. 4, an approximating apparatus in accordance with the present invention is shown in conjunction with surgical clamping jaw structure. This approximating apparatus is substantially similar to that discussed above with respect to the tissue measuring device. A stationary first surgical clamping jaw 86 is attached to housing 88. A movable second surgical clamping jaw 90 is retained in housing 88 for substantially parallel approximation toward stationary first surgical clamping jaw 86. The second surgical clamping jaw 90 comprises a distal end 92 having a working clamping surface 94 formed on an inner surface thereof matable in opposing relation to a corresponding working clamping surface 96 formed on an inner surface of the stationary first surgical clamping jaw 86. The proximal end 98 of the second surgical clamping jaw 90 forms two parallel longitudinal arms 100 forming a yoke therebetween. A first camming pin 102 is inserted through opposing transverse bores 104 formed in the parallel longitudinal arms 100 of the second surgical clamping jaw 90. A second camming pin 106 is inserted through opposing transverse bores 108 formed in the parallel longitudinal arms 100 of the second surgical clamping jaw 90 proximal of opposing bores 104. At least one of the camming pins 102, 104 is positioned within perpendicular parallel grooves 110 formed in the sidewalls of frame means 88 to prevent axial movement of the second surgical clamping jaw 90 relative to the first surgical clamping jaw 86.

A camming bar 112 having first and second camming slots 114 and 116 is axially positioned in the yoke formed by parallel longitudinal arms 100 for longitudinal movement therethrough. First and second camming pins 102, 106 are disposed in first and second camming slots 114, 116 respectively for longitudinal angular movement therein. In the approximating apparatus of FIG. 4, camming slots 114 and 116 extend diagonally and remain substantially parallel throughout their length. Thus, in this configuration the first and second surgical clamping jaws remain substantially parallel throughout their range of relative movement.

In operation, an appropriate actuating mechanism (not shown) is engaged to drive camming bar 112 in a longitudinal distal direction. This longitudinal distal movement of the camming bar 112 causes first and second camming pins 102, 106 to move in parallel diagonal camming slots 114, 116 causing the substantially parallel approximation of the second surgical clamping jaw relative to the first.

The apparatus of FIGS. 5-6 utilizing surgical stapling working ends may advantageously be used in conjunction with the tissue measuring device of FIGS. 1-3, particularly where both the tissue measuring and stapling devices are interchangable with and actuatable by a single actuating means. For example, prior to stapling, the tissue measuring device of FIGS. 1-3 is inserted onto an appropriate actuating means and used to capture tissue and generate a size measurement thereof. Based on that generated measurement, a staple size is selected which will accurately and efficiently join the tissue. Thereafter, the surgical stapling jaw structure having a staple cartridge therein with staples of a preselected size is inserted onto the actuating means and positioned to staple the tissue.

It is readily apparent to one skilled in the art that the angular configuration of the camming slots 114 and 116 may be varied, either collectively or individually, to achieve different substantially parallel approximation sequences. For example, as shown in FIGS. 1-3 above, one slot may be configured to allow for an initially wider opening at the distal ends of the jaws to facilitate capture of tissue. It is possible to orient the slot configurations at a different angle to close the distal ends of the jaws first, prior to final approximation, in order to avoid loss of the captured tissue out of the distal end.

Referring now to FIGS. 5-6, approximating apparatus in accordance with the present invention is shown configured for use in a surgical stapler device shown generally at 118. A first stationary jaw structure 120 comprises a substantially U-shaped channel having a proximal end 122 and a distal end 124. A staple cartridge 126 is positioned within the U-shaped channel at the distal end of the first stationary jaw structure 120. Second movable jaw structure 128 comprises an anvil 130 formed on a distal end and a first and second sloped camming surface 132, 134 formed on an upper portion of a proximal end thereof. The first and second jaw structures are interconnected by guide means constituted by a pair of transverse pins 136, 138 which extend through the proximal end of second movable jaw structure 128, and two pair of corresponding vertical parallel slots 140, 142 formed in vertical side walls of the proximal end 122 of the first stationary jaw structure 120, in which slots the pins 136, 138 are retained Thus the second movable jaw structure 128 fits within the U-shaped channel of first stationary jaw structure 120 for substantially parallel reciprocal motion therein.

A camming housing 144 surrounds the respective proximal ends of the first and second jaw structure 120,

128 and is mounted for longitudinal reciprocal motion relative to the jaw structure. First and second camming surfaces 146, 148 are formed in an upper portion of the camming housing 144 and respectively engage first and second sloped camming surfaces 132, 134 formed in the proximal end of second jaw structure 128. A leaf spring 150 is positioned between the first and second camming surfaces 132, 134 and engages a shelf 152 formed in a vertical side wall of the proximal end of the first stationary jaw structure 120. This leaf spring 150 serves to bias apart the respective distal ends of the first and second jaw structure 120, 128.

In operation, an actuating means, shown generally at 154 in FIG. 6, is activated to move camming housing 144 in a distal longitudinal direction relative to the first and second jaw structure 120, 128. This action causes first and second camming surfaces 146, 148 on the camming housing 144 to respectively engage first and second sloped camming surfaces 132, 134 on the proximal end of the second movable jaw structure 128. Since transverse pins 136, 138 in vertical parallel slots 140, 142 allow for only substantially parallel approximating motion, the second movable jaw structure 128 is moved in a substantially parallel fashion relative to first stationary jaw structure 120 resulting in approximation of anvil 130 and staple cartridge 126. Once tissue to be stapled is captured and the jaws are approximated, the staples can be fired and tissue cut using known structure and techniques.

In the apparatus shown in FIGS. 5-6, the first and second jaw structure 120, 128 and the camming housing 144 are formed as a unit and are removable from the actuating means 154 simply by applying a longitudinal distal force sufficient to disengage the unit therefrom. Thus, a wide variety of different types of jaw structure, i.e. clamps (FIG. 4), tissue measurers (FIG. 1), grippers (FIG. 7), etc., may be utilized with a single actuating means.

FIGS. 7-10 show a sequence of closure for an approximating apparatus substantially similar to that described above with respect to FIGS. 5-6 with the exception that the first and second jaw structure are provided with gripping ends 156, 158 instead of an anvil and staple cartridge. In FIGS. 7-8 the first stationary jaw structure 160 and the second movable jaw structure 162 are disposed in the open position with their respective distal ends, formed as gripping ends 156, 158, spaced apart. Camming housing 144 is driven longitudinally distally such that camming surfaces 146, 148 on the camming housing 144 engage and drive sloped camming surfaces 132, 134, respectively, on the proximal end of the second movable jaw structure 162. This causes the second movable jaw structure 162 to move in substantially parallel approximation motion guided by vertical slots 140, 142 and transverse pins 136, 138. Upon reaching its full longitudinal distal travel (FIGS. 9-10) camming surfaces 146, 148 move onto locking flats 164, 166 formed at the top of the sloped camming surfaces 132, 134. Thus, the gripping ends 156, 158 are maintained in close parallel approximation around subject tissue.

As in previous embodiments, the approximating apparatus of FIGS. 7-10 may be removable from and insertable into a wide variety of actuating means.

FIGS. 11-14 disclose approximating apparatus in accordance with a preferred embodiment of the present invention utilizing cutting jaw elements. Referring to FIG. 11, a first movable jaw structure 168 is shown including a distal end having cutting structure 170 formed therein and a proximal end having first and second camming surfaces 172, 174 on a top portion thereof and first and second longitudinally disposed camming chambers 176, 178 formed in a sidewall portion thereof. A camming housing 180, shown in cross section in FIG. 11, encloses a portion of the proximal end of the first movable jaw structure 168 and has first and second camming bosses 182, 184 disposed in opposing sidewalls adjacent to first and second camming chambers 176, 178 in first movable jaw structure 168. Camming housing 180 also includes first and second camming surfaces 186, 188 disposed adjacent first and second camming surfaces 172, 174 on the proximal end of the first movable jaw structure (see FIGS. 12-14). A second stationary jaw structure 190 is disposed within camming housing 180 and interfits with first movable jaw structure 168 for relative substantially parallel approximation therewith. The proximal end of the stationary jaw structure 190 is prevented from rotational motion by locking pin 196. A cutting block 192 is disposed on a distal end of jaw structure 190 for substantially parallel working interaction with cutting structure 170.

In the embodiment of FIGS. 11-14, first movable jaw structure 168 is initially disposed in an open extended orientation relative to second stationary jaw structure 190 (FIG. 12). First camming bosses 182 are positioned proximally beneath first camming chambers 176 while second camming bosses 184 are disposed in a pivot chamber 194 formed in a proximal portion of second camming chambers 178. As seen in FIG. 12, this configuration allows the opening between the distal ends of cutting structure 170 and cutting block 192 ("A" in FIG. 12) to be wider than the opening between the proximal ends of cutting structure 170 and cutting block 192 ("B" in FIG. 12). Thus initial tissue capture is facilitated.

In operation, camming housing 180 is moved longitudinally distally by actuating means (not shown) relative to first and second jaw structure 168, 190. As the camming housing 180 moves distally, second camming bosses 184 are freed from pivot chamber 194 and camming surfaces 186 and 188 respectively engage camming surfaces 172 and 174 formed in the proximal end of first movable jaw structure 168. This camming engagement effects a substantially parallel approximation of the cutting structure 170 and the cutting block 192 (See FIGS. 13-14). Camming bosses 182, 184 serve to guide this substantially parallel approximation as they travel along the diagonally sloping surface of the

first and second camming chambers 176, 178.

This substantially parallel approximation of the jaw structure permits an accurate and controlled separation of the tissue without the uneven and progressive shearing action inherent in conventional scissors structure.

To the extent not already indicated, it also will be understood by those of ordinary skill in the art that any one of various specific embodiments herein described and illustrated may be further modified to incorporate features shown in other of the specific embodiments. For example, first and second jaw structures may both be adapted to move transverse to the longitudinal axis of the device to effect parallel approximation by providing complementary camming means for each jaw structure.

Claims

1. Apparatus for approximating jaw structure of surgical instrumentation which has a longitudinal axis, the apparatus comprising:

   first elongate jaw structure (22) having a distal working end and proximal end,
   second elongate jaw structure (28) disposed in spaced relation to and connected with said first jaw structure, said second jaw structure having a distal working end for substantially parallel working interaction with said first jaw structure and a proximal end, said first and second jaw structure being interconnected for substantially parallel approximation; and
   approximating means (56, 144) having structure for relative movement between said first and second jaw structure in substantially parallel relation with respect to one another to permit working interaction between said distal working ends of said first and second jaw structure:

   characterised in that:

   the apparatus is suitable for endoscopic or laparoscopic procedures, having a proximal end at which the apparatus is manipulated and a distal end (24) where the approximating jaw structure is located and orientated with the length of each jaw structure arranged parallel to the said longitudinal axis; and
   camming structure (40, 44), located at the distal end of the apparatus, for camming the relative movement between said first and second jaw structure in said substantially parallel relation, the camming structure comprising spaced parallel camming surfaces (52, 54).

2. Apparatus as claimed in claim 1 wherein said approximating means comprises:

   a frame means (30);
   a camming plate (50) axially slidable within said frame means, said camming plate having a first and second camming slot (52, 54) formed therein;
   a first camming pin (40) disposed in said first camming slot and transversely mounted in the proximal end of said second jaw structure, said first camming pin engaging transverse slots in said frame means (30) to restrict axial movement of said distal working end of said second jaw structure;
   a second camming pin (44) disposed in said second camming slot (54) and transversely mounted parallel to said first camming pin in the proximal end of said second jaw structure such that axial movement of said camming plate relative to said frame means caused substantially parallel approximation of said distal working ends of said first and second jaw structure.

3. Apparatus as claimed in claim 2 wherein at least one (54) of said camming slots includes a substantially axially aligned portion such that when said camming pin is disposed in said substantially axially aligned portion, said distal working ends of said first and second jaw structure move into non-parallel alignment to facilitate capture of tissue.

4. Apparatus as claimed in claim 2 or 3 further comprising actuating means (56) axially disposed in said frame means for driving said camming plate axially therein.

5. Apparatus as claimed in claim 2, 3 or 4 further comprising a spring (60) loaded actuating means (56) for axially moving said camming plate to open said distal working ends of said first and second jaw structure in a substantially parallel manner.

6. Apparatus as claimed in any one of the preceding claims, wherein:

   said first jaw structure (120) has a substantially channel shaped proximal end (122);

   said second jaw structure (128) has a proximal end at least partially disposed within said channel shaped proximal end of said first jaw structure for substantially parallel approximation of said working ends, said second jaw structure including at least one camming surface (132, 134) thereon,

   guide means (136, 138) interconnecting the proximal ends of said first and second jaw structure to permit substantial parallel approximation thereof, and

   the approximating means engages said at least one camming surface (132, 134) on said second jaw structure to cause said first and second jaw structure to approximate in a substantially parallel

orientation.

7. Apparatus as claimed in claim 6 further comprising biasing means (150) for maintaining a substantially separate parallel orientation of said working ends of said first and second jaw structure in an open position.

8. Apparatus as claimed in claim 6 or 7 wherein said guide means (136, 138) comprises at least one transverse pin mounted in said proximal end of said second jaw structure which pin rides in vertical slots formed in the proximal end of said first jaw structure.

9. Apparatus as claimed in claim 6, 7 or 8 wherein said second jaw structure is provided with at least a pair of axially aligned camming surfaces disposed in said proximal end and said approximating means comprises a camming tube (144) surrounding the proximal ends of said first and second jaw structure and having a pair of camming elements (146, 148) for engaging the axially aligned camming surfaces (132, 134) on said second jaw structure to effect substantially parallel approximation of the working ends of said first and second jaw structure upon axial movement of said camming tube.

10. Apparatus as claimed in claim 9 wherein said camming surfaces disposed in said proximal end of said second jaw structure comprises two pairs of ramped slots (140, 142) formed in opposing transverse sides of said proximal end of said second jaw structure and said camming tube includes two pairs of pins (182, 184) fixed in said tube and engageable with said pairs of ramped slots to effect substantially parallel approximation of the working ends of said first and second jaw structure upon axial movement of said camming tube.

11. Apparatus as claimed in claim 9 or 10 further comprising:

a frame means for engaging at least the proximal end of said first and second jaw structure; and

actuating means (154) disposed in said frame means and engageable with said camming tube (144) for effecting axial movement thereof to cause said working ends of said first and second jaw means to approximate in a substantially parallel orientation.

12. Apparatus as claimed in any one of claims 1 to 8 wherein said actuating means includes a shaft (56) axially disposed in said frame means and spring (60) loaded to maintain said working ends of said first and second jaw means in a closed approximated position.

13. Apparatus as claimed in claim 2 or any one of claims 3 to 12 as dependent on claim 2, and comprising:

frame means; and

endoscopic means (26) defining a longitudinal axis and extending distally from said frame means, said endoscopic means comprising:

said first jaw structure (22);

and said second jaw structure (28), said approximating means (144) having said camming plate (50) axially slidable within said endoscopic means, said camming plate having said first and second camming slot (52, 54) formed therein;

the first camming pin (40) being disposed in said first camming slot and transversely mounted in the proximal end of said second jaw structure; said first camming pin engaging transverse slots in said endoscopic means to restrict axial movement of said distal working end of said second jaw structure; and

the second camming pin disposed in said second camming slot and transversely mounted parallel to said first camming pin in the proximal end of the said second jaw structure such that axial movement of said camming plate relative to said endoscopic means caused substantially parallel approximation of said distal working ends of said first and second jaw structure.

14. Apparatus as claimed in claim 13, wherein at least one of said camming slots includes a substantially axially aligned portion such that when said camming pin is disposed in said substantially axially aligned portion, said distal working ends of said first and second jaw structure move into non-parallel alignment to facilitate capture of tissue.

15. Apparatus as claimed in claim 13 or 14 and including supplemental approximation assist means (59) disposed in said apparatus to operate in conjunction with said approximating means to effect substantially parallel working interaction between the distal working ends of said first and second jaw structure.

16. Apparatus as claimed in claim 15 wherein said supplemental approximation assist means comprises:

a secondary compression spring (61) for engaging at least one of said surgical jaw structures to assist the approximating means to effect parallel working interaction between tissue measuring structure of said jaws.

17. Apparatus as claimed in claim 16, wherein said supplemental approximation assist means further comprises a fork (65), said fork and said secondary compression spring being disposed in said camming plate such that said fork is engageable with the proximal end of at least one of said surgical jaw structures to assist the approximating means to effect parallel working interaction between said tissue measuring structure.

18. Apparatus as claimed in any one of the preceding claims wherein said working ends of said first and second jaw structure collectively comprise surgical cutting jaws.

19. Apparatus as claimed in any one of claims 1 to 17 wherein said first jaw structure includes a staple cartridge (126) portion having a plurality of staples disposed therein and said second jaw structure comprises anvil structure (130) having a staple forming surface thereon.

Patentansprüche

1. Vorrichtung zum Annähern eines Klemmbackenaufbaus einer chirurgischen Instrumentierung, die eine Längsachse besitzt, wobei die Vorrichtung umfaßt:

   - einen ersten langgestreckten Klemmbackenaufbau (22) mit einem distalen Arbeitsende und einem proximalen Ende,

   - einen zweiten langgestreckten Klemmbackenaufbau (28), der in beabstandeter Beziehung zu dem ersten Klemmbackenaufbau angeordnet und mit diesem verbunden ist, wobei der zweite Klemmbackenaufbau ein distales Arbeitsende für eine im wesentlichen parallele Arbeitswechselwirkung mit dem ersten Klemmbackenaufbau und ein proximales Ende besitzt, wobei der erste und zweite Klemmbakkenaufbau für eine im wesentlichen parallele Annäherung miteinander verbunden sind; und

   - Annäherungsmittel (56, 144) mit einem Aufbau für eine relative Bewegung zwischen dem ersten und zweiten Klemmbackenaufbau in einer im wesentlichen relativen Beziehung in bezug aufeinander, um eine Arbeitswechselwirkung zwischen den distalen Arbeitsenden des ersten und zweiten Klemmbackenaufbaus zu gestatten:

   dadurch **gekennzeichnet**, daß

   - die Vorrichtung geeignet ist für endoskopische oder laparoskopische Vorgänge, mit einem proximalen Ende, an dem die Vorrichtung betätigt wird, und einem distalen Ende (24), wo der sich annähernde Klemmbackenaufbau angeordnet ist und mit der Länge jedes Klemmbakkenaufbaus parallel zu der Längsachse angeordnet ausgerichtet ist; und

   - ein Kurvenaufbau (40, 44), der an dem distalen Ende der Vorrichtung angeordnet ist, um die relative Bewegung zwischen dem ersten und zweiten Klemmbackenaufbau in der im wesentlichen parallelen Beziehung zu verschieben, wobei der Klemmbackenaufbau beabstandete parallele Kurvenoberflächen (52, 54) umfaßt.

2. Vorrichtung gemäß Anspruch 1, worin das Annäherungsmittel umfaßt

   - ein Rahmenmittel (30);

   - eine Kurvenplatte (50), die axial innerhalb des Rahmenmittels verschiebbar ist, wobei die Kurvenplatte einen ersten und einen zweiten Kurvenschlitz (52, 54) darin gebildet besitzt;

   - einen ersten Kurvenstift (40), der in dem ersten Kurvenschlitz angeordnet ist und quer in dem proximalen Ende des zweiten Klemmbackenaufbaus befestigt ist, wobei der erste Kurvenstift in Querschlitze in dem Rahmenmittel (30) einrückt, um eine axiale Bewegung des distalen Arbeitsendes des zweiten Klemmbackenaufbaus zu beschränken;

   - einen zweiten Kurvenstift (44), der in dem zweiten Kurvenschlitz (54) angeordnet ist und parallel zu dem ersten Kurvenstift in dem proximalen Ende des zweiten Klemmbackenaufbaus dergestalt quer befestigt ist, daß eine axiale Bewegung der Kurvenplatte relativ zu dem Rahmenmittel eine im wesentlichen parallele Annäherung der distalen Arbeitsenden des ersten und zweiten Klemmbackenaufbaus verursacht.

3. Vorrichtung gemäß Anspruch 2, worin zumindest einer (54) der Kurvenschlitze umfaßt einen im wesentlichen axial ausgerichteten Bereich, so daß, wenn der Kurvenstift in dem im wesentlichen axial ausgerichteten Bereich angeordnet ist, sich die distalen Arbeitsenden des ersten und zweiten Klemmbackenaufbaus in nicht-parallele Ausrichtung bewegen, um das Greifen von Gewebe zu erleichtern.

4. Vorrichtung gemäß Anspruch 2 oder 3 weiter umfassend ein Betätigungsmittel (56), das axial in dem Rahmenmittel angeordnet ist, um die Kurvenplatte axial darin anzutreiben.

5. Vorrichtung gemäß Anspruch 2, 3 oder 4 weiter umfassend ein feder-(60)-belastetes Betätigungsmittel (56), um die Kurvenplatte axial zu bewegen, um die distalen Arbeitsenden des ersten und zweiten Klemmbackenaufbaus in einer im wesentlichen parallelen Weise zu öffnen.

6. Vorrichtung gemäß einem der vorhergehenden Ansprüche worin:

- der erste Klemmbackenaufbau (120) ein im wesentlichen rinnenförmiges proximales Ende (122) besitzt;

- der zweite Klemmbackenaufbau (128) ein proximales Ende besitzt, das zumindest teilweise innerhalb des rinnenförmigen proximalen Endes des ersten Klemmbackenaufbaus angeordnet ist für eine im wesentlichen parallele Annäherung der Arbeitsenden, wobei der zweite Klemmbackenaufbau zumindest eine Kurvenoberfläche (132, 134) darauf umfaßt,

- Führungsmittel (136, 138), das die proximalen Enden des ersten und zweiten Klemmbackenaufbaus verbindet, um eine im wesentlichen parallele Annäherung derselben zu gestatten, und

- das Annäherungsmittel in Eingriff tritt mit der zumindest einen Kurvenoberfläche (132, 134) auf dem zweiten Klemmbackenaufbau, um zu verursachen, daß sich der erste und zweite Klemmbackenaufbau in einer im wesentlichen parallelen Ausrichtung annähern.

7. Vorrichtung gemäß Anspruch 6, weiter umfassend Vorspannmittel (150), um eine im wesentlichen getrennte parallele Ausrichtung der Arbeitsenden des ersten und zweiten Klemmbackenaufbaus in einer offenen Position beizubehalten.

8. Vorrichtung gemäß Anspruch 6 oder 7, worin das Führungsmittel (136, 138) zumindest einen querverlaufenden Stift umfaßt, der in dem proximalen Ende des zweiten Klemmbackenaufbaus befestigt ist, wobei sich der Stift in einem vertikalen Schlitz verschiebt, der in dem proximalen Ende des ersten Klemmbackenaufbaus gebildet ist.

9. Vorrichtung gemäß Anspruch 6, 7 oder 8, worin der zweite Klemmbackenaufbau mit zumindest einem Paar von axial ausgerichteten Kurvenoberflächen versehen ist, die in dem proximalen Ende angeordnet sind, und das Annäherungsmittel umfaßt eine Verschieberöhre (144), die die proximalen Enden des ersten und zweiten Klemmbackenaufbaus umgibt und ein Paar von Kurvenelementen (146, 148) besitzt, um in Eingriff zu treten mit den axial ausgerichteten Kurvenoberflächen (132, 134) auf dem zweiten Klemmbackenaufbau, um eine im wesentlichen parallele Annäherung der Arbeitsenden des ersten und zweiten Klemmbackenaufbaus bei einer axialen Bewegung der Verschieberöhre zu bewirken.

10. Vorrichtung gemäß Anspruch 9, worin die in dem proximalen Ende des zweiten Klemmbackenaufbaus angeordneten Kurvenoberflächen umfassen zwei Paare von ansteigenden Schlitzen (140, 142), die in gegenüberliegenden Querseiten des proximalen Endes des zweiten Klemmbackenaufbaus gebildet sind, und die Verschieberöhre umfaßt zwei Paare von Stiften (182, 184), die in der Röhre befestigt sind und in Eingriff bringbar sind mit den Paaren von ansteigenden Schlitzen, um eine im wesentlichen parallele Annäherung der Arbeitsenden des ersten und zweiten Klemmbackenaufbaus bei einer axialen Bewegung der Verschieberöhre zu bewirken.

11. Vorrichtung gemäß Anspruch 9 oder 10, weiter umfassend:

- einen Rahmen mit zum In-Eingriff-Bringen zumindest des proximalen Endes des ersten und zweiten Klemmbackenaufbaus; und

- Betätigungsmittel (154), das in dem Rahmenmittel angeordnet ist und in Eingriff bringbar ist mit der Verschieberöhre (144), um eine axiale Bewegung derselben zu bewirken, um zu verursachen, daß die Arbeitsenden des ersten und zweiten Klemmbackenmittels sich in einer im wesentlichen parallelen Ausrichtung annähern.

12. Vorrichtung gemäß einem der Ansprüche 1 bis 8, worin das Betätigungsmittel umfaßt einen Schaft (56), der axial in dem Rahmenmittel angeordnet ist und federbelastet (60) ist, um die Arbeitsenden des ersten und zweiten Klemmbackenmittels in einer geschlossenen angenäherten Position zu halten.

13. Vorrichtung gemäß Anspruch 2 oder einem der Ansprüche 3 bis 12, die von Anspruch 2 abhängig sind, und umfassend:

- Rahmenmittel; und

- ein endoskopisches Mittel (26), das eine Längsachse definiert und sich distal von dem Rahmenmittel erstreckt, wobei das endoskopische Mittel umfaßt:

  - den ersten Klemmbackenaufbau (22);

  - und den zweiten Klemmbackenaufbau

(28), wobei das Annäherungsmittel (144) die Kurvenplatte (50) besitzt, die axial innerhalb des endoskopischen Mittels verschiebbar ist, wobei die Kurvenplatte den ersten und zweiten Kurvenschlitz (52, 54) darin gebildet besitzt;

- wobei der erste Kurvenstift (40) in dem ersten Kurvenschlitz angeordnet und im proximalen Ende des zweiten Klemmbakkenaufbaus quer befestigt ist; wobei der erste Kurvenstift in Eingriff tritt mit Querschlitzen in dem endoskopischen Mittel, um eine Axialbewegung des distalen Arbeitsendes des zweiten Klemmbackenaufbaus zu begrenzen; und

- wobei der zweite Kurvenstift in dem zweiten Kurvenschlitz angeordnet und parallel zum ersten Kurvenstift in dem proximalen Ende des zweiten Klemmbackenaufbaus so quer befestigt ist, daß eine axiale Bewegung der Kurvenplatte relativ zu dem endoskopischen Mittel eine im wesentlichen parallele Annäherung der distalen Arbeitsenden des ersten und zweiten Klemmbackenaufbaus verursacht.

14. Vorrichtung gemäß Anspruch 13, worin zumindest einer der Kurvenschlitze umfaßt einen im wesentlichen axial ausgerichteten Bereich, so daß, wenn der Kurvenstift in dem im wesentlichen axial ausgerichteten Bereich angeordnet ist, die distalen Arbeitsenden des ersten und zweiten Klemmbakkenaufbaus sich in eine nicht parallele Ausrichtung bewegen, um das Greifen von Gewebe zu erleichtern.

15. Vorrichtung gemäß Anspruch 13 oder 14 und umfassend ein zusätzliches Annäherungsunterstützungsmittel (59), das in der Vorrichtung angeordnet ist, um in Verbindung mit dem Annäherungsmittel zu arbeiten, um eine im wesentlichen parallele Arbeitswechselwirkung zwischen den distalen Arbeitsenden des ersten und zweiten Klemmbakkenaufbaus zu bewirken.

16. Vorrichtung gemäß Anspruch 15, worin das zusätzliche Annäherungsunterstützungsmittel umfaßt:

- eine zweite Druckfeder (61) zum In-Eingriff-Treten an zumindest einem der chirurgischen Klemmbackenaufbauten, um das Annäherungsmittel beim Erzielen einer parallelen Arbeitswechselwirkung zwischen einem Gewebemeßaufbau der Klemmbacken zu unterstützen.

17. Vorrichtung gemäß Anspruch 16, worin das zusätzliche Annäherungsunterstützungsmittel weiter umfaßt eine Gabel (65), wobei die Gabel und die zweite Druckfeder in der Kurvenplatte so angeordnet sind, daß die Gabel in Eingriff bringbar ist mit dem proximalen Ende von zumindest einem der chirurgischen Klemmbackenaufbauten, um das Annäherungsmittel beim Erzielen einer parallelen Arbeitswechselwirkung zwischen dem Gewebemeßaufbau zu unterstützen.

18. Vorrichtung gemäß einem der vorhergehenden Ansprüche, worin die Arbeitsenden des ersten und zweiten Klemmbackenaufbaus gemeinsam chirurgische Schneidklemmbacken umfassen.

19. Vorrichtung gemäß einem der Ansprüche 1 bis 17, worin der erste Klemmbackenaufbau umfaßt einen Klammermagazinbereich (126) mit einer Mehrzahl von Klammern, die darin angeordnet sind, und der zweite Klemmbackenaufbau umfaßt einen Anschlagaufbau (130) mit einer Klammerverformungsoberfläche darauf.

Revendications

1. Appareil pour rapprocher des structures de mâchoires d'instrumentation chirurgicale qui comporte un axe longitudinal, l'appareil comprenant :

une première structure de mâchoire allongée (22) ayant une extrémité distale de travail et une extrémité proximale,
une seconde structure de mâchoire allongée (28) disposée de façon à être espacée de ladite première structure de mâchoire et connectée à celle-ci, ladite seconde structure de mâchoire ayant une extrémité distale de travail pour une interaction de travail substantiellement parallèle avec ladite première structure de mâchoire et une extrémité proximale, lesdites première et seconde structures de mâchoires étant interconnectées pour un rapprochement sensiblement parallèle ; et
un moyen de rapprochement (56, 144) ayant une structure pour un mouvement relatif entre lesdites première et seconde structures de mâchoires d'une manière sensiblement parallèle l'une par rapport à l'autre pour permettre une interaction de travail entre lesdites extrémités distales de travail desdites première et seconde structures de mâchoires ; caractérisé en ce que :
l'appareil est adapté pour des procédures endoscopiques ou laparoscopiques, ayant une extrémité proximale à laquelle l'appareil est manipulé et une extrémité distale (24) où la structure de rapprochement de mâchoires est située et orientée avec la longueur de chaque structure de mâchoire agencée parallèlement

audit axe longitudinal ; et

une structure de came (40, 44) située à l'extrémité distale de l'appareil, pour soumettre à l'action d'une came un mouvement relatif entre lesdites première et seconde structures de mâchoires dans ladite disposition sensiblement parallèle, la structure de came comprenant des surfaces de came parallèles espacées (52, 54).

2. Appareil selon la revendication 1, dans lequel ledit moyen de rapprochement comprend :

un moyen formant châssis (30) ;
une plaque à cames (50) axialement coulissante dans ledit moyen formant châssis, ladite plaque à cames ayant une première et seconde fentes à came (52, 54) formées dans celle-ci ;
une première broche de came (40) disposée dans ladite première fente à came et transversalement montée dans l'extrémité proximale de ladite seconde structure de mâchoire, ladite première broche de came s'engageant dans les fentes transverses dans ledit moyen formant châssis (30) pour restreindre le mouvement axial de ladite extrémité distale de travail de ladite seconde structure de mâchoire ;
une seconde broche de came (44) disposée dans ladite seconde fente à came (54) et transversalement montée parallèlement à ladite première broche de came dans l'extrémité proximale de ladite seconde structure de mâchoire de façon que le mouvement axial de ladite plaque à cames par rapport audit moyen de châssis provoque un rapprochement sensiblement parallèle desdites extrémités distales de travail desdites première et seconde structures de mâchoires.

3. Appareil selon la revendication 2, dans lequel au moins l'une (54) desdites fentes à came comprend une portion alignée sensiblement axialement de façon que lorsque ladite broche de came est disposée dans ladite portion alignée sensiblement axialement, lesdites extrémités distales de travail desdites première et seconde structures de mâchoires se déplacent en alignement non parallèle pour faciliter la capture du tissu.

4. Appareil selon la revendication 2 ou 3, comprenant en outre un moyen d'actionnement (56) disposé axialement dans ledit moyen de châssis pour entraîner ladite plaque à cames axialement dans celui-ci.

5. Appareil selon la revendication 2, 3 ou 4, comprenant en outre un moyen d'actionnement (56) chargé par ressort (60) pour déplacer axialement ladite plaque à cames pour ouvrir lesdites extrémités distales de travail desdites première et seconde structures de mâchoires d'une manière sensiblement parallèle.

6. Appareil selon l'une des revendications précédentes, dans lequel :

ladite première structure de mâchoire (120) comporte une extrémité proximale en forme sensiblement de canal (122) ;
ladite seconde structure de mâchoire (128) comporte une extrémité proximale disposée au moins partiellement dans ladite extrémité proximale en forme de canal de ladite première structure de mâchoire pour un rapprochement sensiblement parallèle desdites extrémités de travail, ladite seconde structure de mâchoire comprenant au moins une surface formant came (132, 134) sur celle-ci,
un moyen de guidage (136, 138) interconnectant les extrémités proximales desdites première et seconde structures de mâchoires pour permettre un rapprochement sensiblement parallèle de celles-ci, et
le moyen de rapprochement vient en contact avec ladite au moins une surface formant came (132, 134) sur ladite seconde structure de mâchoire pour provoquer le rapprochement desdites première et seconde structures de mâchoires dans une

orientation sensiblement parallèle.

7. Appareil selon la revendication 6, comprenant en outre un moyen de sollicitation (150) pour maintenir une orientation parallèle substantiellement séparée desdites extrémités de travail desdites première et seconde structures de mâchoires dans une position ouverte.

8. Appareil selon la revendication 6 ou 7, dans lequel ledit moyen de guidage (136, 137) comprend au moins une broche transverse montée dans ladite extrémité proximale de ladite seconde structure de mâchoire, laquelle broche se déplace dans des fentes verticales formées dans l'extrémité proximale de ladite première structure de mâchoire.

9. Appareil selon la revendication 6, 7 ou 8, dans lequel ladite seconde structure de mâchoire est munie dans une paire de surfaces de came axialement alignées disposées dans ladite extrémité proximale et ledit moyen de rapprochement comprend un tube de came (144) entourant les extrémités proximales desdites première et seconde structures de mâchoires et ayant une paire d'éléments de came (146, 148) pour venir en contact avec les surfaces de came axialement alignées

(132, 134) sur ladite seconde structure de mâchoire pour effectuer un rapprochement substantiellement parallèle des extrémités de travail desdites première et seconde structures de mâchoires par mouvement axial dudit tube de came.

10. Appareil selon la revendication 9, dans lequel lesdites surfaces formant came disposées dans ladite extrémité proximale de ladite seconde structure de mâchoire comprennent deux paires de fentes en forme de rampe (140, 142) formées dans des côtés transversaux opposés de ladite extrémité proximale de ladite seconde structure de mâchoire et ledit tube de came comprend deux paires de broches (182, 184) fixées dans ledit tube et pouvant s'engager dans lesdites paires de fentes en forme de rampe pour effectuer un rapprochement substantiellement parallèle des extrémités de travail desdites première et seconde structures de mâchoires par mouvement axial dudit tube de came.

11. Appareil selon la revendication 9 ou 10, comprenant en outre :

un moyen de châssis pour engager au moins l'extrémité proximale desdites première et seconde structures de mâchoires ; et
un moyen d'actionnement (154) disposé dans ledit moyen de châssis et pouvant s'engager avec ledit tube de came (144) pour effectuer un mouvement axial de celui-ci afin de provoquer le rapprochement desdites extrémités de travail desdits premier et second moyens de mâchoires dans une orientation substantiellement parallèle.

12. Appareil selon l'une des revendications 1 à 8, dans lequel ledit moyen d'actionnement comprend un arbre (56) disposé axialement dans ledit moyen de châssis et un ressort (60) chargé pour maintenir lesdites extrémités de travail desdits premier et second moyens de mâchoires dans une position rapprochée fermée.

13. Appareil selon la revendication 2 ou l'une des revendications 3 à 12 rattachées à la revendication 2, et comprenant :

un moyen de châssis ; et
un moyen endoscopique (26) définissant un axe longitudinal et s'étendant distalement dudit moyen de châssis, ledit moyen endoscopique comprenant :

ladite première structure de mâchoire (22) ;
et ladite seconde structure de mâchoire (28), ledit moyen de rapprochement (144) ayant ladite plaque à cames (50) axialement coulissante dans ledit moyen endoscopique, ladite plaque à cames ayant lesdites première et seconde fentes à came (52, 54) formées dans celle-ci ;
la première broche de came (40) étant disposée dans ladite première fente à came et montée transversalement dans l'extrémité proximale de ladite seconde structure de mâchoire ; ladite première broche de came s'engageant dans les fentes transversales dans ledit moyen endoscopique pour restreindre le mouvement axial de ladite extrémité distale de travail de ladite seconde structure de mâchoire ; et
la seconde broche de came disposée dans ladite seconde fente à came et montée transversalement parallèle à ladite première broche de came dans l'extrémité proximale de ladite seconde structure de mâchoire de façon que le mouvement axial de ladite plaque à cames par rapport audit moyen endoscopique provoque un rapprochement substantiellement parallèle desdites extrémités distales de travail desdites première et seconde structures de mâchoires.

14. Appareil selon la revendication 13, dans lequel au moins l'une desdites fentes à came comprend une portion alignée sensiblement axialement de façon que lorsque ladite broche de came est disposée dans ladite portion alignée substantiellement axialement, lesdites extrémités distales de travail desdites première et seconde structures de mâchoires se déplacent en alignement non parallèle pour faciliter la capture du tissu.

15. Appareil selon la revendication 13 ou 14, et comprenant un moyen supplémentaire d'assistance au rapprochement (59) disposé dans ledit appareil pour fonctionner conjointement avec ledit moyen de rapprochement pour effectuer une interaction de travail sensiblement parallèle entre les extrémités distales de travail desdites première et seconde structures de mâchoires.

16. Appareil selon la revendication 15, dans lequel ledit moyen supplémentaire d'assistance au rapprochement comprend :

un ressort de compression secondaire (61) pour venir en contact avec au moins l'une desdites structures de mâchoires chirurgicales pour aider le moyen de rapprochement à effectuer l'interaction de travail parallèle entre la structure de mesure de tissu desdites mâchoires.

17. Appareil selon la revendication 16, dans lequel ledit moyen supplémentaire d'assistance au rapprochement comprend en outre une fourche (65), ladite fourche et ledit ressort de compression secondaire étant disposés dans ladite plaque à cames de façon que ladite fourche puisse s'engager avec l'extrémité proximale d'au moins l'une desdites structures de mâchoires chirurgicales pour aider le moyen de rapprochement à effectuer l'interaction de travail parallèle entre ladite structure de mesure de tissu.

18. Appareil selon l'une des revendications précédentes, dans lequel lesdites extrémités de travail desdites première et seconde structures de mâchoires comprennent collectivement des mâchoires de coupe chirurgicale.

19. Appareil selon l'une des revendications 1 à 17, dans lequel ladite première structure de mâchoire comprend une portion de cartouche à agrafes (126) ayant une pluralité d'agrafes disposées dans celle-ci et ladite seconde structure de mâchoire comprend une structure d'enclume (130) ayant une surface de formation d'agrafes sur celle-ci.

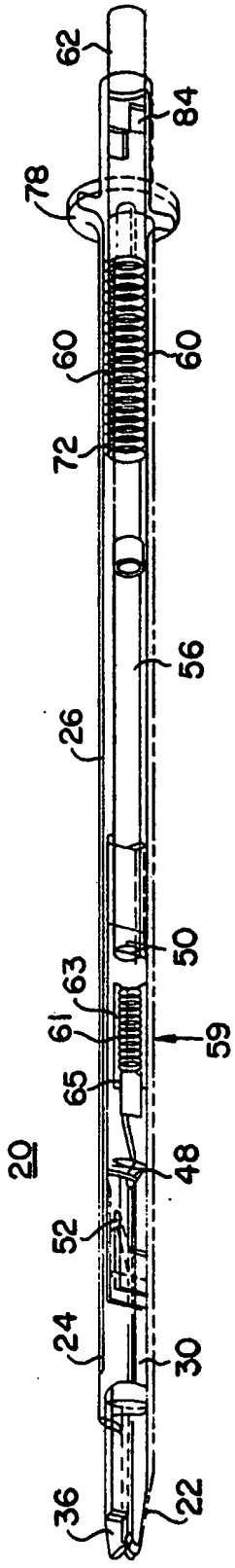
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FIG.1

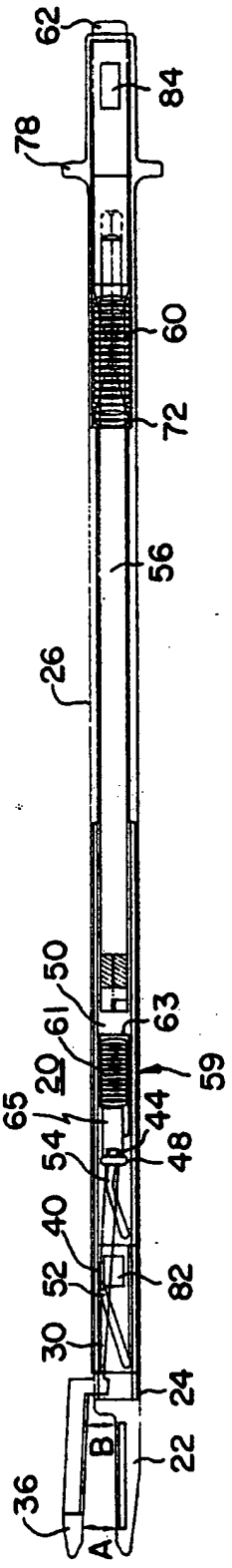
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FIG.2

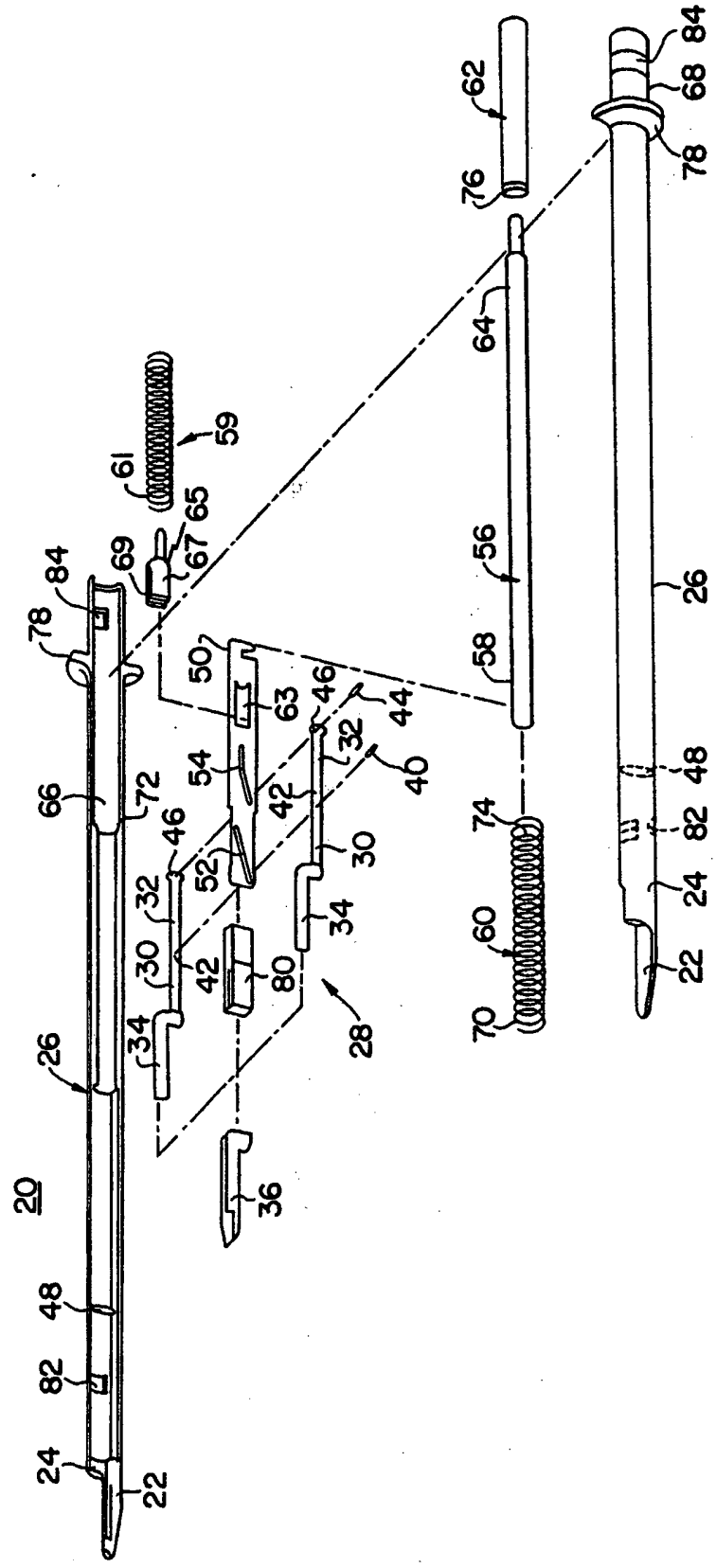
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FIG.3

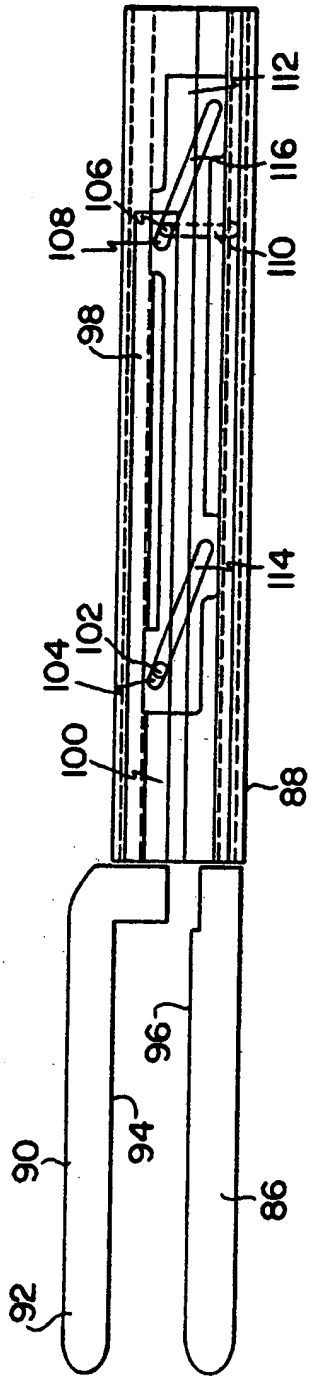

FIG.4

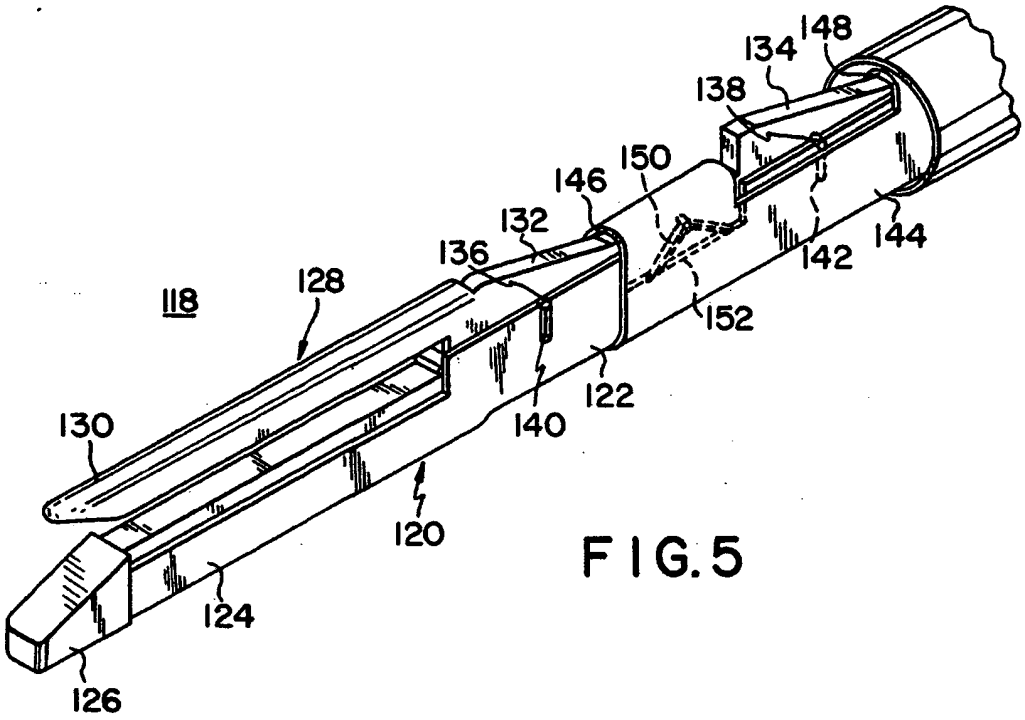
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FIG. 5

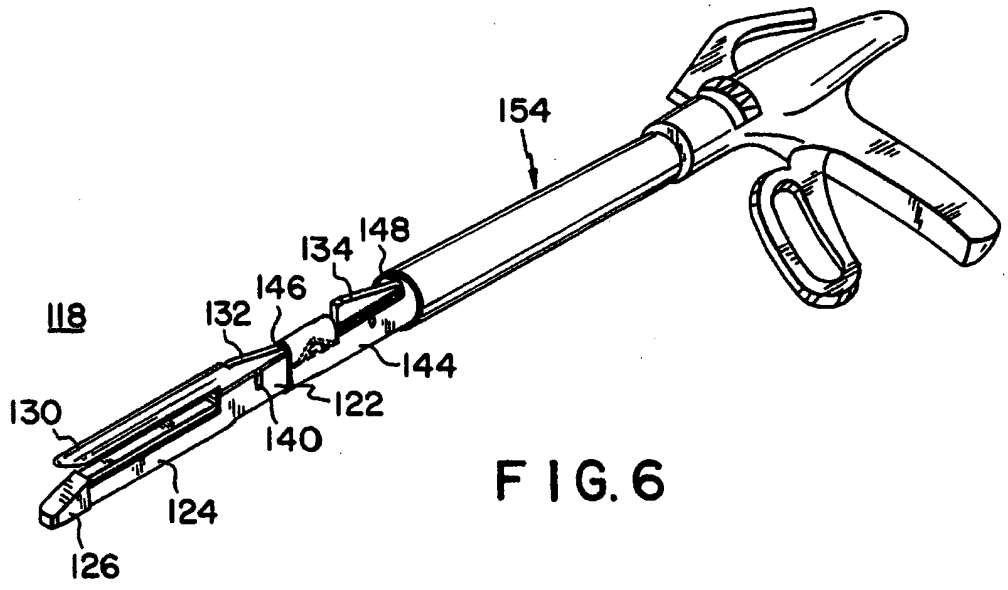
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FIG. 6

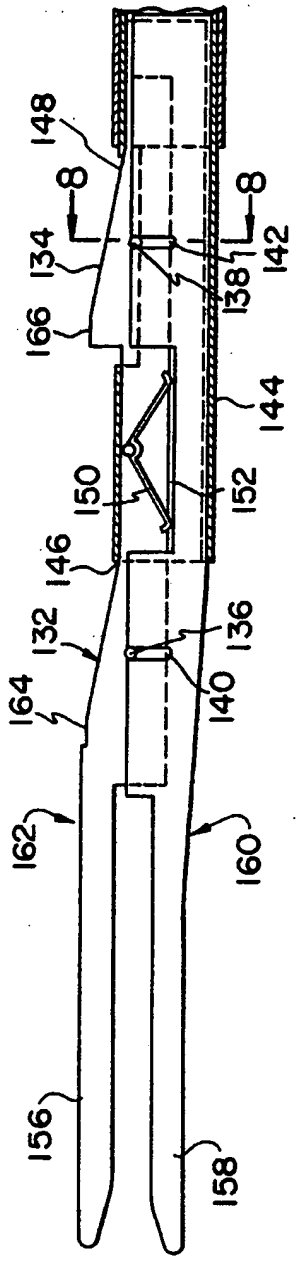
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FIG.7

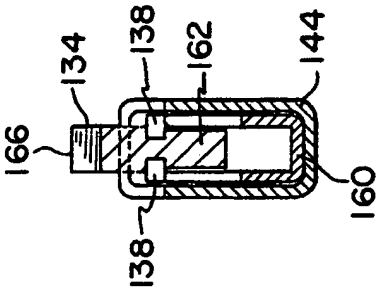
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FIG.8

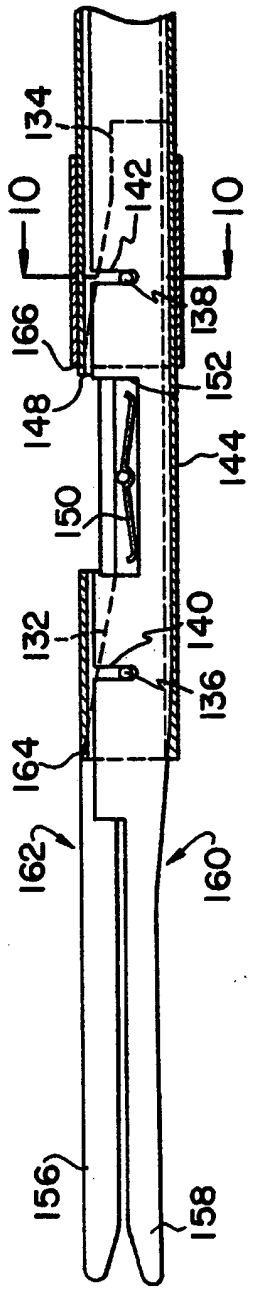
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FIG.9

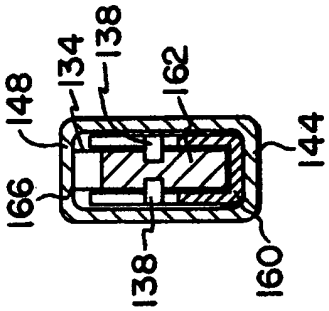
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FIG.10

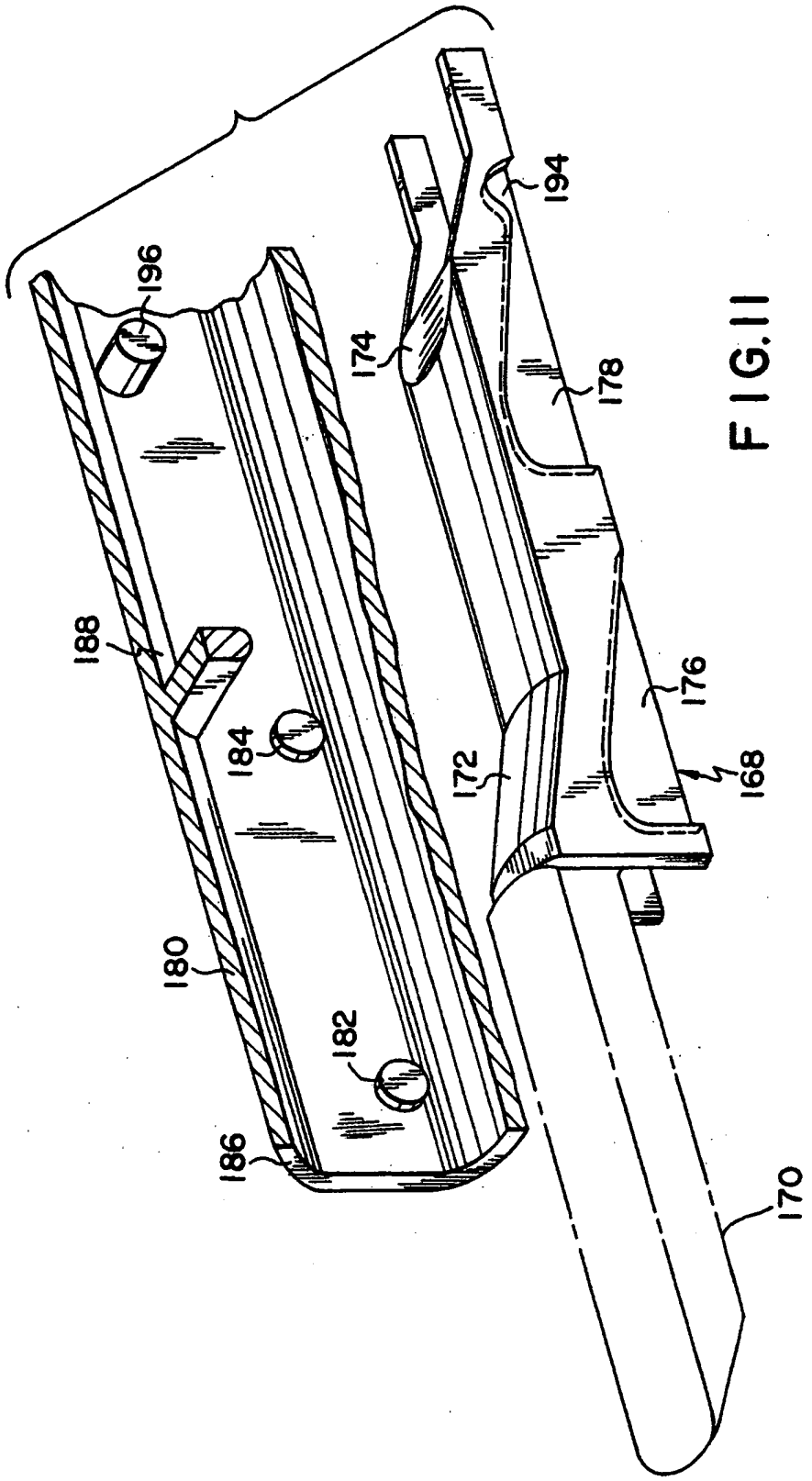

FIG.11

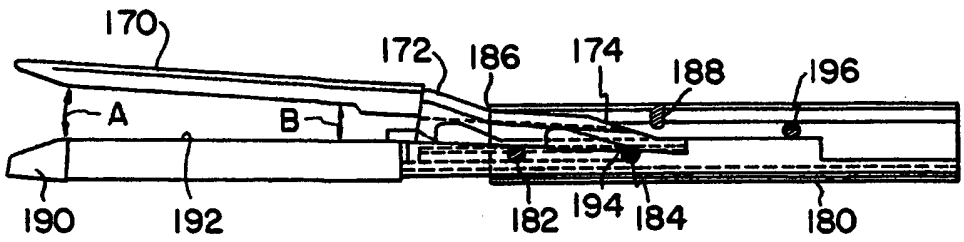

FIG.12

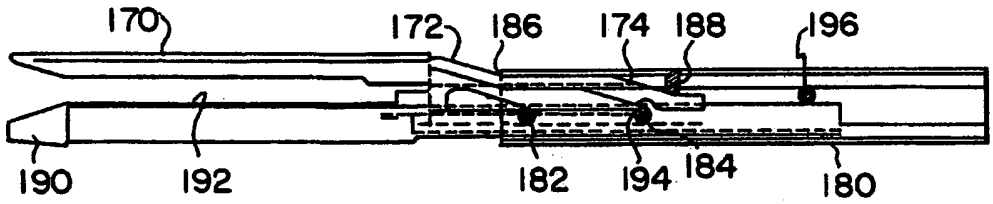

FIG.13

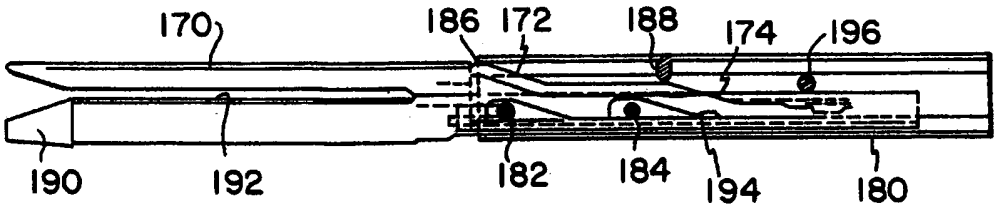

FIG.14